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AUTHOR Levine, Daniel U.; Mares, Kenneth R.
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ABSTRACT

The relationships among geographic origins, externship placement, and post-graduation practice location of University of Missouri Kansas City (UMKC) 1977-79 pharmacy graduates were studied. The aim was to help select, prepare, and encourage students to locate in underserved communities. It is assumed the data can help decide whether to retain, expand, or eliminate policies that influence practice location after graduation. Variables include: population of community of high school graduation, percentage of pharmaceutical requirements met in the community of high school graduation, population of community of first externship, population of community of second externship, percent of pharmaceutical requirements met in the community of first externship, percent of pharmaceutical requirements met in the community of second externship, sex, and type of first and second externship. The findings show that: (1) students from high schools in small- or medium-size communities and/or high- or medium-need communities are more likely to locate in small- or medium-size, high- or medium-need communities than were students who graduated from high schools in large and/or low-need communities; (2) population and need of the communities in which externships were served generally are associated with location in small or medium-size, high- or medium-need communities; (3) student's sex is not associated with location in communities classified by size or by pharmaceutical need; (4) type of externship is not consistently associated with the decision to locate in high- or medium-need communities (combined); (5) very few students from large and/or low-need communities locate in high-need communities after graduation. In general, it is suggested that if a goal of the UMKC School of Pharmacy is to place sufficient numbers of students in relatively high-need communities, some preference should be given to applicants from small- or medium-size communities, particularly during the first externship. (CC)

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RELATIONSHIPS BETWEEN GEOGRAPHIC ORIGINS, EXTERNSHIP PLACEMENT, AND PRACTICE LOCATION SUBSEQUENT TO GRADUATION OF UMKC SCHOOL OF PHARMACY STUDENTS

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Dr. Daniel U. Levine
Professor of Education
Director, Center for the
Study of Metropolitan Problems in Education

Dr. Kenneth R. Mares
Director of Evaluation
Western Missouri Area
Health Education Center

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The purpose of this study is to examine the relationships between geographic origins, externship placement, and practice location subsequent to graduation of students who graduated from the UMKC School of Pharmacy in 1977, 1978, and 1979. These relationships are important because the School places a priority on preparing students for and placing them after graduation in communities which are underserved with respect to the need for professional pharmacists. In working to attain this goal, the School's admissions process gives some preference to students with rural origins and arranges externships in rural settings in which students can become familiar with pharmaceutically underserved communities. These and other actions may help select, prepare, and encourage students to locate in underserved communities. Data on relationships between origins, externship location, and practice location can help to decide whether to retain, expand, or eliminate policies which are thought to bear on practice location after graduation.

Variables and Methods

The variables used in carrying out this study were as follows:

1. Population* (1977) of community of high school graduation: Below 5,000 = Small; 5,001 to 50,000 = Medium; 50,001 or more = Large. It should be noted that among the 172 students for whom data were available on this variable, 33 of 65 who were in the "Large" category were from the Kansas City (30) and St. Louis (3) metropolitan areas.

2. Percentage (1975) of pharmaceutical requirements met in the Primary Health Care Area of the community of high school graduation. These data were obtained from the Missouri Department of Social Services.** Below 80 percent = Low; 80 percent through 99.9 percent = Medium; 100 percent or above = High. We classified communities low in percentage of requirements met as "high need," and those high in percent of requirements met as "low need."

*U.S. Department of Commerce, Bureau of the Census.

**Lanis Hicks, Bruce Moran, Gayle Lane, and Lyn Fox, Missouri Health Manpower Analyses: Pharmacy Manpower, Jefferson City, Missouri. Missouri Department of Social Services, June, 1976.

3. Population of the community in which the first externship was served: Below 5,001 = Small; 5,001 to 50,000 = Medium; 50,000 or more = Large.

4. Percentage of pharmaceutical requirements met in the Primary Health Care Area in which the first externship was served. Below 80 percent = Low; 80 percent through 99.9 percent = Medium; 100 percent or above = High.

5. Population of the community in which the second externship was served: Below 5,001 = Small; 5,001 to 50,000 = Medium; 50,000 or more = Large.

6. Percentage of pharmaceutical requirements met in the Primary Health Care Area in which the second externship was served. Below 80 percent = Low; 80 percent through 99.9 percent = Medium; 100 percent or above = High.

7. Population of the community in which the students located to practice after graduation. Below 5,000 = Small; 5,001 to 135,000 = Medium; 135,000 or more = Large.* The reason why this variable was coded differently than the other population variables was to maintain relatively high numbers in the categories to facilitate analysis. Among the 149 students for whom data were available on this variable, all 57 who were in the "Large" category were practicing in the Kansas City (54) or St. Louis (3) metropolitan areas.

8. Percentage of pharmaceutical requirements met in the Primary Health Care Area in which the student located after graduation. Below 70 percent = Low; 70 percent through 114.9 percent = Medium; 115 percent or above = High. Fifty-four of the 84 students in the "High" category were practicing in the Kansas City metropolitan area, which has a score of 117 on the variable.**

9. Sex of student.

10. Type of first externship, either Hospital Pharmacy or Community Pharmacy.

11. Type of second externship, either Hospital Pharmacy or Community Pharmacy.

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*These data were obtained from state licensing department records on location of practicing pharmacists in 1980.

**Coding categories for this variable were slightly different from those for variables 2, 4, and 6 in order to have a better balance across cells for statistical analysis.

The approach used to analyze the data was to compute cross-tabulations between the two variables describing practice location after graduation (i.e., population and percentage of pharmaceutical requirements met in the community of practice location) and all the other variables considered as possible determinants or predictors of practice location. In order to obtain sufficient cases for statistical comparison, the small and medium categories regarding population of community of practice location and the low and medium categories (i.e., high- and medium-need) regarding pharmaceutical requirements met in this community were combined into one category, and categories of the predictor variables also were combined after examining the distribution of scores and determining which combinations would yield cells large enough for comparison. Results of the cross-tabulations are shown in Table 1.

Findings

As shown in Table 1, students who graduated from high schools in small- or medium-size communities were significantly more likely to locate in small- or medium-size communities and in communities high or medium in need for pharmacists (i.e., low or medium in percentage of requirements met in the PCHA) than were students who came from large communities. For example, fifty-five of the 85 students (64 percent) from small- or medium-size communities located in small- or medium-size communities, as compared with 28 of the 49 students (57 percent) who came from large communities.

Similarly, need of the community of high school graduation also was associated with location in a small- or medium-size community and in a high- or medium-need community. Forty-six of the 66 students (70 percent) from high- or medium-need communities located in small or medium communities as compared with only 30 of 58 students (52 percent) from low-need communities, and 42 of

Table 1

Predictor Variables Cross-Tabulated with Size and Need of Communities in Which Students Located After Graduation*

Predictor Variables**		A: Number of Students Located in Small or Medium Communities	A: Number of Students Located in Large Communities		B: Number of Students Located in High or Medium-Need Communities	B: Number of Students Located in Low-Need Communities
1. Population of community of high school graduation.	Small or Medium	55	30	Small or Medium	21	59
	Large	28	21	Large	4	48
		Chi-square = 7.52; p < .01			Chi-square = 11.44; p < .001	
2. Percentage of pharmaceutical requirements met in the community of high school graduation.	Low or Medium	46	20	Low or Medium	42	27
	High	30	28	High	21	42
		Chi-square = 4.20; p < .05			Chi-square = 10.01; p < .01	
3. Population of community of first externship.	Small or Medium	61	17	Small or Medium	48	33
	Large	27	27	Large	22	36
		Chi-square = 11.42; p < .001			Chi-square = 6.15; p < .05	
4. Population of community of second externship.	Small	57	22	Small or Medium	44	40
	Medium or Large	32	22	Large	25	31
		Chi-square = 3.95; p < .05			Chi-square = .81; p = .60	
5. Percent of pharmaceutical requirements met in the community of first externship.	Low or Medium	63	15	Low or Medium	60	25
	High	26	28	High	15	44
		Chi-square = 15.46; p < .001			Chi-square = 28.47; p < .001	
6. Percent of pharmaceutical requirements met in the community of second externship.	Low or Medium	62	20	Low or Medium	56	31
	High	28	24	High	15	40
		Chi-square = 6.83; p < .01			Chi-square = 18.55; p < .001	

*Small communities = 5,000 or below population; Medium = 5,001 to 135,000; Large = 135,000 or more (Kansas City and St. Louis). High-need communities = Below 70 percent of Primary Health Care Area pharmaceutical requirements met in 1975; Medium-need = 70 percent through 114.9 percent of requirements met; Low-need = 115 percent or more of requirements met.

**See text for definitions of predictor variables.

Table 1 (continued)

Predictor Variables		A: Number of Students Located in Small or Medium Communities	A: Number of Students Located in Large Communities		B: Number of Students Located in High or Medium-Need Communities	B: Number of Students Located in Low-Need Communities
7. Sex	Male	57	35	Male	48	49
	Female	33	21	Female	24	33
		Chi-square = .01; p = .99			Chi-square = .79; p = .60	
8. Type of first externship	Hospital	34	30	Hospital	27	38
	Community	57	16	Community	45	35
		Chi-square = 9.52; p <.01			Chi-square = 3.10; p< .10	
9. Type of second externship	Hospital	34	21	Hospital	26	31
	Community	56	26	Community	45	43
		Chi-square = .61; p = .55			Chi-square = .42; p = .50	

69 (61 percent) from high- or medium-need communities located in high- or medium-need communities as compared with only 21 of 63 (33 percent) from low-need communities.

As further indicated in Table 1, the following variables also were associated with location after graduation in small- or medium-size communities:

-- population of community of first externship.

-- population of community of second externship.

-- percentages of requirements respectively met in these communities.

-- type of first externship. Students in community-pharmacy externships were more likely to locate in small or medium communities than were students in hospital-pharmacy externships.

Similarly, the following variables also were associated at the .05 level or better with location after graduation in high- or medium-need communities:

-- population of the community of first externship.

-- percentage of requirements met (low or medium) in the communities of the first and second externships.

Additional conclusions which can be reached based on the data in Table 1 are as follows:

1. Sex of the student is not associated with location in communities classified by size or by pharmaceutical need.

2. Type of externship is not associated with the decision to locate in high- or medium-need as compared with low-need communities.

Overall implications also can be identified concerning admissions and operational policies of the School of Pharmacy. For example, if a goal of the School is to work toward locating graduates in high- or medium-need communities (as defined by percent of pharmaceutical requirements met in the PCHA

of the community), then selection procedures should assure the admission of adequate numbers of applicants from small- and medium-size communities and/or from high- or medium-need communities, and once accepted, students should be encouraged to serve externships in small- or medium-size, high- or medium-need communities. Of course it is not possible to be sure that type of community of high school graduation and type of community in which the externship is served have a direct cause-and-effect influence on practice location after graduation, but the correlations between these variables do indicate that some relationships exist and that policies based on these relationships might produce a higher percentage of graduates locating in high- or medium-need communities.

In order to further clarify the relationships between predictor variables and subsequent practice location, an additional set of cross-tabulations was computed to identify differences between students who had located in high-need communities (70 percent or less of the pharmaceutical requirements met in the Primary Health Care Area of the community) compared with students who had located in low- or medium-need communities. Data from these cross tabulations are shown in Table 2.

As indicated in Table 2, students who locate in high-need communities still differ from students who locate in low- or medium-need communities (as in Table 1) in population and percentage of requirements met in community of high school graduation and in population of the first externship community as well as in percentage of requirements met in the first and second externship communities. In addition, type of first and second externship is now significantly related to location after graduation. Thus if a School of Pharmacy goal is to locate students in high-need as opposed to medium- and low-need communities, the School should encourage students to serve externships in community pharmacies. In addition, it is noteworthy that depending on the predictor variable, only four

Table 3

Predictor Variables Cross-Tabulated with Need of Communities (High vs. Low and Medium) in Which Students Located After Graduation*

Predictor Variables**		Number of Students Located in High Need Communities	Number of Students Located in Low and Medium
1. Population of community of high school graduation.	Small or Medium	21	69
	Large	4	48
	Chi-square = 5.56; p < .05		
2. Percentage of pharmaceutical requirements met in the community of high school graduation.	High or Medium	21	48
	Low	4	59
	Chi-square = 12.44; p < .001		
3. Population of community of first externship.	Small or Medium	20	61
	Large	5	53
	Chi-square = 4.45; p < .05		
4. Population of community of second externship.	Small	7	31
	Medium or Large	19	83
	Chi-square = .05; p = .85		
5. Percent of pharmaceutical requirements met in the community of first externship.	High or Medium	21	60
	Low	4	55
	Chi-square = 8.53; p < .01		
6. Percent of pharmaceutical requirements met in the community of second externship.	High	18	36
	Medium or Low	8	80
	Chi-square = 13.15; p < .001		
7. Sex	Male	19	78
	Female	8	49
	Chi-square = .77; p = .60		
8. Type of first externship.	Hospital	5	60
	Community	21	59
	Chi-square = 8.39; p < .01		
9. Type of second externship.	Hospital	9	48
	Community	17	71
	Chi-square = 12.21; p < .001		

*Small communities = 5,000 or below population; Medium = 5,001 to 135,000; Large = 135,000 or more (Kansas City and St. Louis). High-need communities = Below 70 percent of Primary Health Care Area pharmaceutical requirements met in 1975; Medium-need = 70 percent through 114.9 percent of requirements met; Low-need = 115 percent or more of requirements met.

**See text for definitions of predictor variables.

or five students from large and/or low-need communities located in high-need communities after graduation. This finding suggests that applicants from large, low-need communities possibly should not be favored if the School of Pharmacy decides to place emphasis on preparing students who will locate in high-need communities after graduation.

Additional analysis also was carried out to determine whether externship characteristics are independently related to practice location after controlling for community origins. Without such an analysis, the possibility exists that relationships between externship characteristics and location after graduation are due to a tendency for students from small, high-need communities to select or agree to community-pharmacy placement in small, high-need communities and then locate in small, high-need communities regardless of their externship assignments. To control for this possibility, separate cross-tabulations were computed for students who were from (a) large, low-need communities, and (b) small- or medium-size, medium- or high-need communities.

As shown in Table 3, placement in a small- or medium-size community for the first or second externship does not appear to be independently associated with subsequent practice location, after controlling for students' origins. For example, among students from small- or medium-size, high- or medium-need communities, there is no association between size of population of the community of second externship and subsequent location: twenty-three of the forty students (58 percent) who served in small- or medium-size communities subsequently located in high- or medium-need communities, as compared with seven of the ten students (70 percent) who served in large communities. This difference does not begin to approach significance at the .05 level (chi-square = .05;

Table 3

Predictor Variables Cross-Tabulated with Need of Communities in Which Students Located After Graduation, by Student Origins*

Predictor Variables**		Number of Students Located in High or Medium-Need Communities	Number of Students Located in Low-Need Communities
1. Population of community of first externship.			
a) Students from large, low need communities.	Small or Medium	5	11
	Large	3	13
		Chi-square = 1.33; p = .25	
b) Students from small- or medium-size, high- or medium-need communities.	Small or Medium	15	19
	Large	3	10
		Chi-square = 1.76; p = .20	
2. Population of community of second externship.			
a) Students from large, low need communities.	Small or Medium	4	10
	Large	3	14
		Chi-square not available due to cell size.	
b) Students from small- or medium-size, high- or medium-need communities.	Small or Medium	23	17
	Large	7	3
		Chi-square = .05; p = .85	
3. Percent of pharmaceutical requirements met in the community of first externship.			
a) Students from large, low need communities.	Low or Medium	5	9
	High	3	16
		Chi-square = 1.78; p = .20	
b) Students from small- or medium-size, high- or medium-need communities.	Low or Medium	26	10
	High	4	10
		Chi-square = 8.00; p < .01	

*Small communities = 5,000 or below population; Medium = 5,001 to 135,000; Large = 135,000 or more (Kansas City and St. Louis). High-need communities = Below 70 percent of Primary Health Care Area pharmaceutical requirements met in 1975; Medium-need = 70 percent through 114.9 percent of requirements met; Low-need = 115 percent or more of requirements met.

**See text for definitions of predictor variables.

Table 3 (continued)

Predictor Variables		Number of Students Located in High or Medium-Need Communities	Low-Need Communities
4. Percent of pharmaceutical requirements met in the community of second externship.			
a) Students from large, low need communities.	Low or Medium	4	8
	High	3	16
		Chi-square not available due to cell size.	
b) Students from small- or medium-size, high- or medium-need communities.	Low or Medium	28	16
	High	3	4
		Chi-square not available due to cell size.	
5. Type of first externship.			
a) Students from large, low need communities.	Hospital	6	13
	Community	2	12
		Chi-square = 1.31; p = .25	
b) Students from small- or medium-size, high- or medium-need communities.	Hospital	6	9
	Community	27	11
		Chi-square = 4.41; p < .05	
6. Type of second externship.			
a) Students from large, low need communities.	Hospital	3	12
	Community	4	13
		Chi-square not available due to cell size.	
b) Students from small- or medium-size, high- or medium-need communities.	Hospital	9	6
	Community	22	14
		Chi-square = .005; p = .99	

$p = .85$).

However, need of the community in which the first externships were served does appear to be independently associated with subsequent location. Students from small or medium-size, high- or medium-need communities were much more likely to locate in high- or medium-need communities if they served in high- or medium-need communities (72 percent) during the first externship than if they served in low-need communities (29 percent; $p < .01$), and the same trend is present among students from large, high-need communities, although not a significant level. These trends also may have been present with reference to need of communities served in during the second externship, but here the cell sizes were too small to allow for calculation of probability values. We can speculate that externships served in relatively high-need communities may expose students to job opportunities or even to job offers there. Conversely, students most anxious to obtain a job may be most likely to extern in a high-need community and then settle there after graduation. This question could be explored in later research to determine how many students actually located later in the community of externship.

Using correlation data of the kind collected in this study, we cannot be sure that students from a given type of community who selected relatively high-need communities for their externships were not already inclined to locate in a relatively high-need community after graduation. We can more firmly conclude, however, that need of the community in which externships are served is more important than its size in predicting future practice location, and that the data allow for the possibility that need of the community of the first externship causally affects subsequent location.

Similar comments can be made regarding the data in Section 5.B of Table 3

indicating that among students from small- or medium-size, high- or medium-need communities, those who serve in community pharmacies during their first externship are more likely (chi-square = 4.41; $p < .05$) to locate in relatively high-need communities than are those who serve in hospital pharmacies. It is probable that students who elect to serve in a community pharmacy are more inclined in the first place to locate in relatively high-need communities than are those who elect hospital pharmacies, particularly since there are relatively few hospital pharmacies in high-need communities and therefore students interested in this specialty would be less likely to extern or locate there after graduation. Whether or not there is a causal connection as regards the type of first externship, however, there is no association with regard to the second externship.

As in the case of Table 2, data in Table 3 showing the subsequent location of students from large, low-need communities demonstrate that few students from this group locate in high- or medium-need communiites after graduation when using the definition of need employed in this study. For example, only two of the fourteen students from large, low-need communities who served their first externship in community pharmacies subsequently located in high- or medium-need communities.

Finally, we also computed tabulations to determine whether population of the community of high school graduation and need of the community of high school graduation are independently related to subsequent practice location after controlling for the other. The data in this analysis (not shown in a table) indicated that when controlling for need of community of high school graduation, population of community of high school graduation was not significantly associated with subsequent practice location among students from high- or medium-

need communities or from low-need communities. (The respective chi-squares values were 1.86 and 1.64, both of which have probability values of approximately twenty percent.) Similarly, need of community of high school graduation was not significantly associated with subsequent location among students from small- or medium-size communities (chi-square = 1.68; p = .20). Among students from large communities, however, there was a strong relationship between need of community of high school graduation and subsequent location: eleven of 15 students (73 percent) from high- or medium-need communities within this subsample subsequently located in high- or medium-need communities, as compared with seven of 25 (28 percent) from low need communities (chi-square = 11.44; $p < .001$). (It should be kept in mind that this group of students from large but high- or medium-need communities is small--only 15--to begin with.) These findings indicate that in general it may make little difference whether population or need of community of high school graduation is used in evaluating applicants for the purpose of selecting students likely to locate in relatively high-need communities after graduation,* but some preference probably should be given to students from relatively high need communities among applicants from large communities.

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*However, the product-moment correlation between need of the community of high school graduation and need of the community of practice location ($r = .32$; $p < .001$) was approximately twice as high as the correlation (.18) between population of the community of high school graduation and need of the practice location community. Partial-correlation analysis showed that controlling for need of the community of high school graduation reduced the correlation between population and need of location community to a non-significant level of .04, but controlling for population of community of high school graduation reduced the correlation between the two need variables only to .26 ($p < .01$). From this point of view, need of community of high school graduation rather than its population should be used in admissions decisions. On the other hand, the text shows that either variable could be used in selecting students from small- or medium-size communities.

Conclusions

The purpose of this study was to identify relationships between geographic origins, externship placement, and practice location subsequent to graduation of students who graduated from the UMKC School of Pharmacy in 1977, 1978, and 1979. Conclusions supported by cross-tabulations of the data were as follows:

1. Students who graduated from high schools in small- or medium-size communities and/or high- or medium-need communities were more likely to locate in small- or medium-size, high- or medium-need communities than were students who graduated from high schools in large and/or low-need communities.

2. Population and need of the communities in which externships were served generally are associated with location in small or medium-size, high- or medium-need communities.

3. Sex of the student is not associated with location in communities classified by size or by pharmaceutical need.

4. Type of externship is not consistently associated with the decision to locate in high- or medium-need communities (combined). However, type of externship is associated with location in high need communities. Students serving externships in community pharmacies are more likely to locate in high-need communities than are students who serve externships in hospital pharmacies. This may be due to the fact that relatively few pharmacies are located in high-need communities.

5. Very few students from large and/or low-need communities locate in high-need communities after graduation.

6. After controlling for student origins, location in a high- or medium-need community is associated with first externship served in a high- or medium-need community among students from small- or medium-size, high- or medium-need

communities.

7. Service in a community pharmacy during the first externship is independently associated with subsequent practice location in a high- or medium-need community among students from small- or medium-size, high- or medium-need communities.

8. Population and need of the community of high school graduation are not independently associated (i.e., when controlling for the other) with subsequent location except that among students from a large community, those who came from high- or medium-need communities were much more likely to locate in high- or medium-need communities than were those from low need communities.

In general, these findings indicate that if a goal of the School of Pharmacy is to place sufficient numbers of students in relatively high need communities after graduation, some preference should be given to applicants from small- or medium-size communities and/or high- or medium-need communities, and an effort should be made to place students in community-pharmacy externships in high- or medium-need communities, particularly during the first externship.